

Topic 3 – Duals, Metrics and Continuous Groups

Pre-Lecture Reading/Post-Lecture Summary

Now that we have some familiarity with groups and representations, it is time to think about symmetries and invariants. In order to build invariants from things that actually transform, we will introduce *dual representations*. We will play off the an analogy with the familiar “dot product” of vectors. In constructing dual representations we will discover the fundamental role of something we use but rarely acknowledge, called the *metric*. We will then turn to using these ideas to explore continuous groups. In particular we will show how starting with a *fundamental* representation and a metric, we can build up the group transformations themselves (or at least matrix version of them). We will apply this prescription to several familiar and some not so familiar examples. If time permits, we will count the free parameters in these groups and make some startling observations as a result. Then you will leave and be happy.